

Title: The Maryland Crabbers

Brief Overview:

This unit will integrate mathematics with a social studies theme. Students will identify number patterns by using baseball scores. They will discover various types of patterns and functional relationships. This unit includes patterns/functions development and basic facts skills review.

Links to NCTM 2000 Standards:

- **Standard 1: Number and Operation**

Mathematics instructional programs should foster the development of number and operation sense so that all students understand numbers, ways of representing numbers, relationships among numbers, and number systems; and understand the meaning of operations and how they relate to each other.

- **Standard 2: Patterns, Functions, and Algebra**

Mathematics instructional programs should include attention to patterns, functions, symbols, and models so that all students understand various types of patterns and functional relationships; and use symbolic forms to represent and analyze mathematical situations and structures.

- **Standard 5: Data Analysis, Statistics, and Probability**

Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students develop and evaluate inferences, predictions, and arguments that are based on data.

- **Standard 6: Problem Solving**

Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; and develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.

- **Standard 7: Reasoning and Proof**

Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students select and use various types of reasoning and methods of proof as appropriate.

- **Standard 8: Communication**

Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expression.

- **Standard 9: Connections**

Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in contexts outside of mathematics.

- **Standard 10: Representation**

Mathematics instructional programs should emphasize mathematical representations to foster an understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas; and use representations to model and interpret physical, social, and mathematical phenomena.

Grade/Level:

Grades 3-5

Duration/Length:

Five days (45 minute periods)

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Addition and subtraction of whole numbers
- Constructing and interpreting tables
- Expressing mathematical ideas in a written and oral forms

Student Outcomes:

Students will be able to:

- identify a number pattern.
- solve for missing numbers in a pattern.
- state the rule for a number pattern.
- create a number pattern.
- work cooperatively in pairs.
- complete and interpret data from a table.

Materials/Resources/Printed Materials:

- Poem “Casey at the Bat” by Ernest Thayer
(poem can be found at [http:// www.clark.net /pub/cosmic/catb_1.html](http://www.clark.net/pub/cosmic/catb_1.html))
- Shape pattern blocks
(paper manipulatives provided - Teacher Resource Sheet C)
- Copies of Teacher Resource Sheets (A-C)
- Copies of Student Worksheets (A - J)
- Chart paper, markers, overhead, or chalkboard
- Overhead shape pattern blocks (optional)
- Overhead transparencies of activity sheets (optional)

Development/Procedures:

Day 1

Pre-assessment: Have the students use a class Venn diagram to compare and contrast two patterns (see Worksheet A). Discuss Venn diagram results guiding students to recognize that patterns are part of our everyday lives and mathematics is everywhere. Partner students and supply each pair with shape pattern blocks. Allow students a few minutes for exploration with the pattern blocks.

Explain the nature of patterns and introduce pattern vocabulary (term, sequence, core - see [Teacher Resource Sheet A](#)). Provide examples of patterns using shape pattern blocks, numbers, and letters ([Teacher Resource Sheet C](#)). This will allow students to move from concrete to abstract as they create their patterns. Discuss how patterns develop, continue, and repeat. Allow time for students to create their own patterns using shape pattern blocks. Have student pairs share their created patterns making sure to explain the rule for each pattern.

Homework: “Creating Patterns” ([Worksheet B - Day One Homework](#))

Students create a pattern and write a rule for their pattern. Students may use shape pattern blocks, numbers, and/or letters.

Day 2

Review Homework: “Creating Patterns” ([Worksheet B - Day One Homework](#)).

Provide students with construction paper strips, markers, and masking tape. Have the students write their created homework patterns for display on the chalkboard/wall. As individual students display their patterns, have the class determine the rule for the pattern. (Option: Complete homework review by grouping students in small cooperative discussion groups.)

Read the poem “Casey at the Bat” (see materials list for poem website). While reading the poem, have students predict how poem will end.

After reading the poem, briefly explain the game of baseball and scoring (see [Teacher Resource Sheet A](#)).

Provide examples of how patterns may be formed from baseball runs scored. Students will then complete “Game One” ([Worksheet C - Day Two Classwork](#)). Allow time for students to share their solutions and rules.

Homework: “Patterns Homework” ([Worksheet D - Day Two Homework](#))

Students complete various types of patterns and write a rule for each pattern.

Day 3

Review Homework: “Patterns Homework” ([Worksheet D - Day Two Homework](#)).

Allow students time to share their homework responses in small cooperative discussion groups. Pair students to recreate the same patterns from their homework using letters instead of numbers. Allow time for partners to share new patterns with other groups.

Note that for the next activity, students may be grouped according to different math abilities (two groups) or in mixed ability groups (whole class). [Worksheet E](#) is provided for on-grade-level students, and [Worksheet F](#) is provided for highly able students.

Distribute “Game Two” ([Worksheet E - Day Three Classwork](#)) and “Game Three” ([Worksheet F - Day Three Classwork](#)) as appropriate. Students begin the worksheet individually. After a few minutes, pair students to share their responses.

Display one copy each of “Game Two” and “Game Three” (chalkboard or overhead). Ask the students to compare and contrast the similarities and differences of each pattern. Have the students state the rule. Note that the rule for [Worksheet F](#) is more complex (see suggested solutions on [Teacher Resource Sheet B](#)).

Homework: “Comparing Scores” ([Worksheet G - Day Three Homework](#))
Students determine the rule of the two patterns (Maryland Crabbers and Visiting Team).
Using a Venn diagram, students compare and contrast the two patterns.

Day 4

Review Homework: “Comparing Scores” ([Worksheet G - Day Three Homework](#))
Have the students share Venn diagram responses.

Distribute “Meeting the Maryland Crabbers” ([Worksheet H - Assessment Writing Prompt](#)).
Review the prompt with the students and present the grading rubric ([Worksheet I - Assessment Rubric](#)).

Distribute “Game Four Prediction” ([Worksheet J - Day Four Classwork](#)). Ask the students to create a number pattern for the number of runs scored in game four based on the Crabbers previous three games. Have the students state the rule for their pattern and justify their response in writing.

Homework: Students prepare their written speech to share.

Day 5

Have the students share their speeches.

Performance Assessment:

Assessment will be ongoing. Students may be assessed on:

- Individual and group participation
- Completion of assignments
- Anecdotal records
- Teacher observation
- Written speech
- Oral presentation of speech

Extension/Follow Up:

Students construct a pictograph, bar graph, or circle graph illustrating the Maryland Crabbers total scores for all four games.

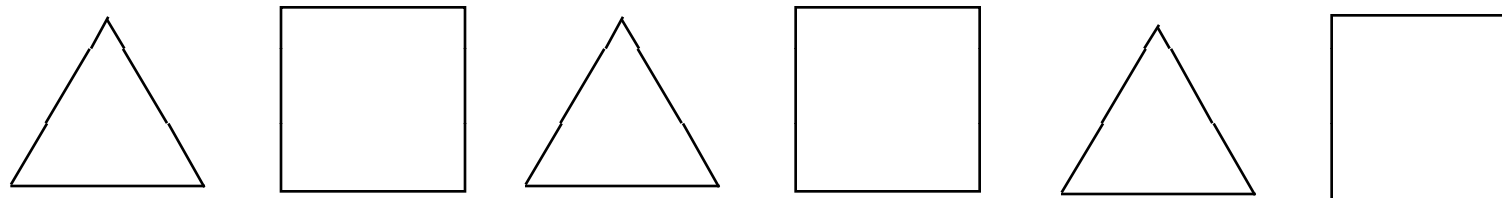
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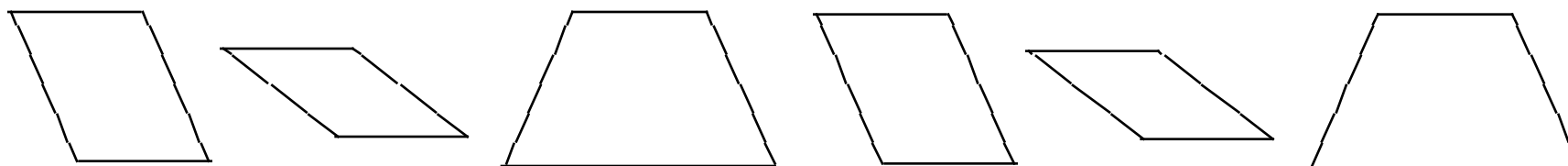
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Pre-Assessment

Pattern A



Pattern B



Name: _____

Date: _____

Creating Patterns

Create a pattern and explain the rule.

____, ____ , ____ , ____ , ____ , ____ , ____ , ...

The rule for this pattern is _____

Name: _____

Date: _____

Game One

This is the scoreboard for the Maryland Crabbers' first baseball game.

SCOREBOARD									
<i>Maryland Crabbers</i>	0	1	2	0		2		1	
<i>Visiting Team</i>	X	X	X	X	X	X	X	X	X

Think about what you know about patterns. How many runs do you think the Crabbers scored in the fifth inning? _____ Explain your thinking.

How many runs do you think the Crabbers scored in the seventh inning? _____ Explain your thinking. _____

How many runs do you think the Crabbers scored in the ninth inning? _____ Explain your thinking. _____

Name: _____

Date: _____

Patterns Homework

Complete the following patterns and explain your rule.

A.

2, 4, 6, 8, ____, ____, ____, ____, ...

The rule for this pattern is _____

B.

1, 3, 1, 3, 1, ____, ____, ____, ____, ...

The rule for this pattern is _____

C.

2, 3, 4, 2, ____, ____, ____, ____, ...

The rule for this pattern is _____

D.

0, 0, 1, 0, 0, ____, ____, ____, ____, ...

The rule for this pattern is _____

Name: _____

Date: _____

Game Two

This is the scoreboard for the Maryland Crabbers' second baseball game.

SCOREBOARD									
<i>Maryland Crabbers</i>	5		1	0	5	2			5
<i>Visiting Team</i>	X	X	X	X	X	X	X	X	X

Think about what you know about patterns. How many runs do you think the Crabbers scored in the second inning? _____ Explain your thinking.

How many runs do you think the Crabbers scored in the seventh inning? _____ Explain your thinking. _____

How many runs do you think the Crabbers scored in the eighth inning? _____ Explain your thinking. _____

Name: _____

Date: _____

Game Three

This is the scoreboard for the Maryland Crabbers' third baseball game.

SCOREBOARD									
<i>Maryland Crabbers</i>	0	2	1	3	2	4	3		
<i>Visiting Team</i>	X	X	X	X	X	X	X	X	X

Think about what you know about patterns. How many runs do you think the Crabbers scored in the eight inning? _____ Explain your thinking.

How many runs do you think the Crabbers scored in the ninth inning? _____
Explain your thinking. _____

If the game went into extra innings, how many runs do you think the Crabbers scored in the tenth inning? _____ Explain your thinking. _____

Name: _____

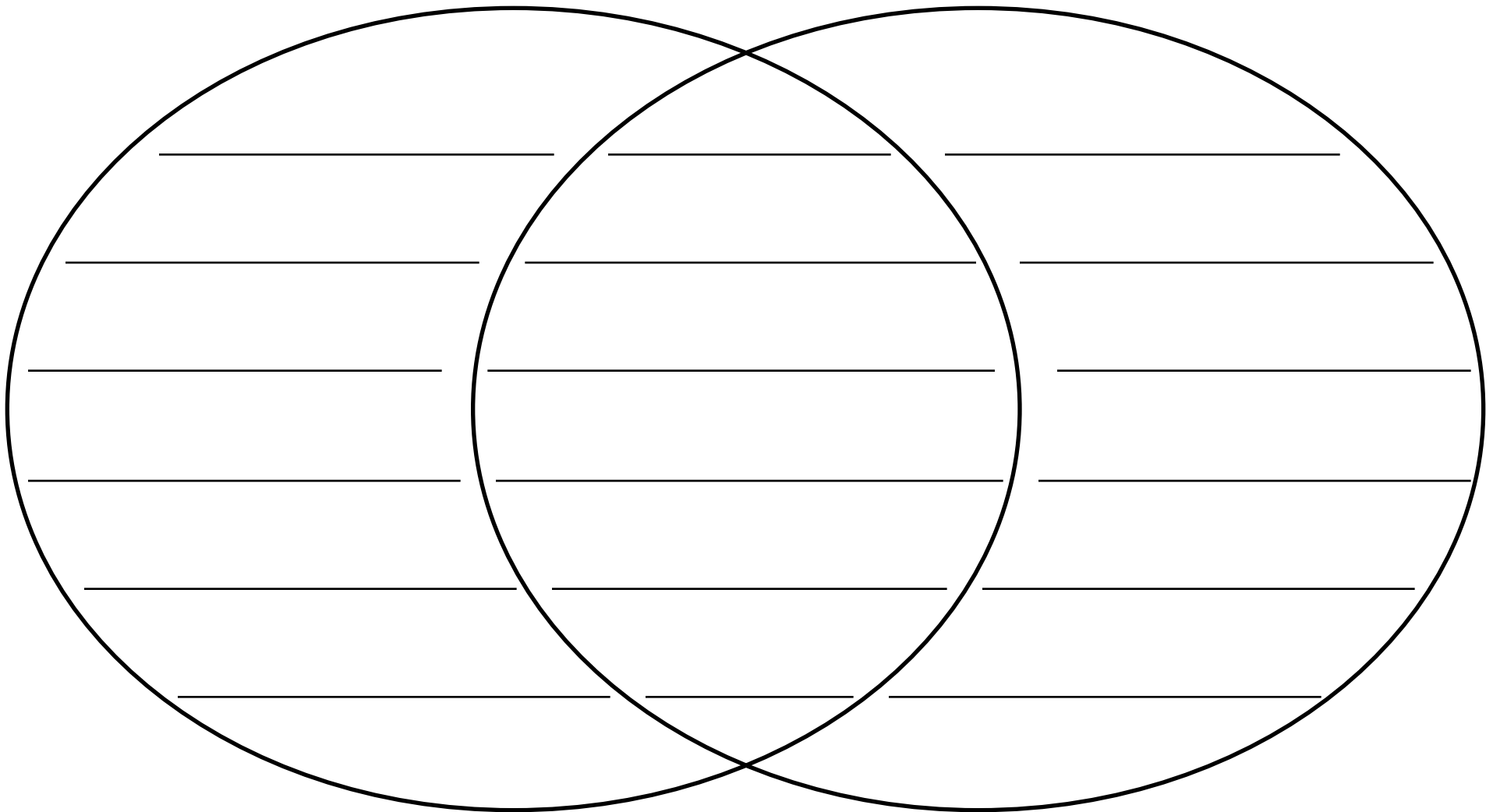
Date: _____

Comparing Scores

This is the scoreboard from another Maryland Crabbers' baseball game.

SCOREBOARD									
<i>Maryland Crabbers</i>	4	8	6	10	8	12	10	14	12
<i>Visiting Team</i>	1	5	3	7	5	9	7	11	9

Compare and contrast the scoring patterns using the Venn Diagram.



Meeting the Maryland Crabbers

Our class was chosen to attend a Maryland Crabbers baseball game, where we will meet the team. After watching the last three games, you noticed patterns of runs scored in each game. You and your partner will analyze the patterns and make a prediction for the next game's score. Prepare a speech for the Maryland Crabbers' game that justifies your prediction.

Maryland Crabbers Speech Rubric

- 3** Math reasoning is clear and correct.
Proper mathematical language is utilized.
There are no grammatical and punctuation errors.
Written work is neat and organized.
- 2** Math reasoning is clear and correct.
Proper mathematical language is utilized.
There are few grammatical and punctuation errors.
Written work is neat and organized.
- 1** Some math reasoning is evident.
Some proper mathematical language is utilized.
There are many grammatical and punctuation errors.
Written work is somewhat legible and organized.
- 0** There is no evidence of math reasoning.
Written work is illegible and unorganized.

Name: _____

Date: _____

Game Four Prediction

You are going to the Maryland Crabbers baseball game later this week. Think about what you already know about patterns. Think about the baseball scores from the first three Maryland Crabbers games. Make a prediction for the next game's score. Remember to state the rule and justify your response.

SCOREBOARD									
<i>Maryland Crabbers</i>									
<i>Visiting Team</i>	X	X	X	X	X	X	X	X	X

The pattern of the next game's score might be _____

Teacher Resource Sheet A

Vocabulary

term - the basic component of a sequence

sequence - a series of terms

core - the smallest set of terms that repeat in a pattern

pattern - a set of terms (core) in a sequence that repeats as the sequence continues

rule - a simple algorithm (adding, subtracting, etc.)

function - a rule that performs in a certain way; each number in a performed function produces a unique result

relationship - the correlation of rules in a sequence

TERM



1, 2, 3, 1, 2, 3, 1, 2, 3, ... ← SEQUENCE



CORE

RULE: "+1 to previous term"

PATTERN: "repeats after three terms"

Baseball Scoring

For this math unit, some background knowledge on the game of baseball is helpful. Basically, baseball is played in nine parts or intervals called "innings." In each inning, both teams have a chance to score points called "runs." Teams generally score less than ten runs per inning. The scoreboard results in this unit were written to create pattern rules for students to identify. Therefore, some scoreboard results may seem unrealistic. As an extension, the teacher may choose to use actual baseball scoreboard results (found in the sports section of most major newspapers) and have students identify possible pattern rules.

Teacher Resource Sheet B (Suggested Solutions)

“Game One” - Worksheet C (Day Two Classwork)

Maryland Crabbers

0	1	2	0	1	2	0	1	2
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“Patterns Homework” - Worksheet D (Day Two Homework)

A.

2,	4,	6,	8,	10,	12,	14,	16	...
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B.

1,	3,	1,	3,	1,	3,	1,	3,	1,	...
----	----	----	----	----	----	----	----	----	-----

C.

2,	3,	4,	2,	3,	4,	2,	3,	...
----	----	----	----	----	----	----	----	-----

D.

0,	0,	1,	0,	0,	2,	0,	0,	3,	...
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“Game Two” - Worksheet E (Day Three Classwork)

Maryland Crabbers

5	2	1	0	5	2	1	0	5
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“Game Three” - Worksheet F (Day Three Classwork)

Maryland Crabbers

0	2	1	3	2	4	3	5	4
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Teacher Resource Sheet C
Shape Pattern Blocks

